National Aeronautics and Space Administration

AEROSPACE TECHNOLOGY ADVISORY COMMITTEE

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NASA Headquarters
Washington, DC

MEETING REPORT

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David O. Swain, Chair

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This report was prepared by
David M. Fry, RSIS/WCI

Meeting Summary

Wednesday, June 25

Opening Remarks
David Swain, Chair of the Aerospace Technology Advisory Committee (ATAC), called the meeting to order and turned to Associate Administrator Jerry Creedon for comments. After thanking participants for coming, Dr. Creedon announced his imminent retirement to tidewater Virginia. Vic Lebacqz would follow as Acting Associate Administrator.

Enterprise Report, Part 1
Dr. Creedon began his report by noting the recent alignment of ATAC meetings with the budget formulation process so as to maximize member input. He also indicated that the changeover to full-cost accounting would occur October 1.

The presentation shifted to four new initiatives of the enterprise. These included aviation security and collaboration with the Federal Aviation Administration (FAA) and other agencies in a new Joint Planning Office (JPO) to support the National Aviation System (NAS). The remaining initiatives addressed aircraft noise and unmanned aerial vehicles (UAVs) in the NAS. Success would be measured by actual use of new technologies.

Turning to FY05 planning activities, Dr. Creedon reported on the allocation of startup funding for technical development and transformation of the NAS. He also noted that work on fuel cells had stopped because an external study suggested that the automobile industry was already committing substantial resources in this field. In the area of security, Code R had decided to proceed with current levels of effort but to broaden them beyond the aircraft itself. In space transportation, NASA was working with the Department of Defense (DOD) on the development of hypersonic vehicles in the National Aerospace Initiative (NAI).

Dr. Creedon next discussed high-end computing, which could be divided into production cycles and special applications. He was interested in developing capabilities needed by NASA that would not be provided by industry. He distinguished between R&D decisions and business decisions. Mr. Swain asked whether the hardware/software research already being done by agencies like DOD and the Department of Energy made NASA's investment unnecessary. Dr. Creedon replied that he suspected NASA did have some unique needs in this area but perhaps not as many as commonly asserted. He had asked his staff what more could be done in software validation and verification; he also planned a modest increase in the Engineering for Complex Systems program.

In space transportation, some attention was given to the impact of the Columbia disaster on the Space Launch Initiative (SLI) and the NAI. Dr. Creedon mentioned the public debate over human vs. robotic exploration of space and suggested that a decision about choosing one or both ultimately boiled down to belief systems rather than scientific merit. Several ATAC members emphasized the intrinsic danger of space flight. Dr. Creedon suggested that the path ahead probably lay in the separation of crew from cargo.

Status of FY04 Aeronautics Technology (AT) Initiatives

AT Theme Director Terrence Hertz reported on four budget requests before Congress: augmentations of the Quiet Aircraft Technology (QAT) and Next National Airspace System (NExTNAS) programs, and two new initiatives—Aviation Security and UAVs in the NAS. For FY05, Code R would request augmentation for Autonomous Craft Capability to Enable Science and Security (ACCESS) and Transforming the NAS.

In the short term, the QAT program was striving to achieve 4-dB reductions in both engine and airframe noise and 2-dB decreases in community noise impact (baseline, 1997). Of this projected10-dB reduction, 4 dB had been achieved in testing, although there would be no direct public benefit until the enhanced technology was incorporated into the fleet. Mr. Hertz expected industry to contribute $50 million to the program. Already workshops were being held. Herman Rediess said that FAA had recently posted an announcement on noise and emission control.

In the Aviation Security program, a communications, navigation, and surveillance (CNS) component had been added at the request of the Department of Homeland Security (DHS) and FAA. Mr. Hertz showed projected funding levels through FY08. Mr. Rediess suggested that it might not be wise to assume that NASA knew what the real problems were in this area. Agreeing, Dr. Creedon asserted that NASA must work in concert with other agencies. Aaron Gellman questioned the totality of Federal efforts to date on explosives detection. Mr. Hertz replied that Code R had been trying to develop a memorandum of understanding (MOU) with the Transportation Security Administration (TSA) to cover various factors, including explosives. Significant partnering with other agencies was already in progress. Kitty Havens was NASA's lead in many of these efforts. Mr. Swain pointed out that TSA had a larger budget for security than NASA did, although TSA was not yet fully organized.

Turning to the UAV program, Mr. Hertz described the enterprise's incremental approach: routine operations above 40,000 ft (FY06), and then quasi-routine UAV flights above 18,000 ft. (FY08). He also described the planning schedule, which ranged from meetings under way to program review in the summer. Delivery of a final plan to FAA, DOD, and NASA should occur at the end of July.

Dr. Hertz next summarized NExTNAS, which was the major follow-on to the Advanced Air Transportation Technology program. He outlined various objectives, deliverables, challenges, and overall funding for the program. Its strategic foci included efficient traffic flow, system-wide operations technologies, and human factors. There was a general

discussion about the extent to which airport on-surface operations were being taken into account. Dr. Creedon said that much could be accomplished with a fairly simple model.

Looking ahead to FY05, Mr. Hertz referred to three portfolio gaps: protection of air travelers and the public, increased mobility and air traffic management (ATM) research, and exploration or revolutionary aeronautical concepts. Discussion ensued about the challenge of combating public perceptions that commercial aviation capacity was no longer an urgent concern after the falloff of air traffic following September 11. Mr. Hertz showed a curve projecting surging commercial air travel in the years ahead. Participants agreed that the recent slowdown represented an opportunity to improve the system before it was overwhelmed later. Frank Cappuccio pointed out that increased cargo demand alone would contribute significantly to the burden. Ed Crow and Mr. Gellman questioned whether the displayed chart represented the most recent and detailed projections.

Mr. Hertz continued his presentation with an overview of the Transformed Air Transportation System. Staff had already been assigned to JPO teams preparing to start research. Attention was being given to the RTCA vision and various concepts of operations. Four areas seemed pivotal: seamless CNS, improved (6-hour) weather prediction, system-wide information management, and transformational technologies identified by the JPO.

The presentation returned to the subject of UAVs. Mr. Hertz focused on their multiple advantages in dangerous, tedious, and dirty operations, as well as their usefulness for earth observing and data collection. A key goal of the UAV initiative was FAA certification for routine NAS operations. Mr. Hertz touched on operations costs and reliability performance gaps, as well as promising partnerships with UNITE, the National Oceanographic and Atmospheric Administration (NOAA), and the Earth Science Enterprise within NASA. Dr. Creedon emphasized the opportunities offered by this technology, fostering collaboration among enterprises. Mr. Hertz continued outlining various features of the program, including its Technology Development Roadmap and deliverables.

General Discussion

Before the next presentation, ATAC members discussed a variety of subjects. Mr. Swain offered ATAC's assistance to Dr. Crow's Revolutionize Aviation Subcommittee (RAS) in articulating its broad requirements. Mr. Swain emphasized that the NAS should allow the economy to determine the future mix of airplanes and airports. He also wanted to learn more about security dictates for the 21st century. Finally, he questioned whether UAVs qualified as missions "as only NASA can do."

Benjamin Neumann noted that REDAC had been unable to reschedule its meetings this year to coincide with ATAC's. Members of ATAC were still welcome, however, to attend the REDAC meeting scheduled for September 17-18. Dr. Crow indicated that RAS had already resolved to represent ATAC at this event if ATAC consented. Mr. Swain voiced his approval. Mr. Neumann said that he was working to arrange a half-day overlap between the February 2004 meetings of both committees.

Dr. Crow briefly commented on the rationale for agency reservations about fuel cell research. The automobile industry, he said, was almost certain not to use the solid oxide fuel cells that interested NASA. It therefore seemed pointless for NASA to look to that sector to incubate relevant technology. Dr. Creedon encouraged further dialog on this subject and suggested that discussions with the Office of Management and Budget (OMB) might not have taken such information into account.

SLI Update

After presenting general information on the new Integrated Space Transportation Plan (ISTP) and the SLI management structure, Rajiv Doreswamy focused on progress in the Orbital Space Plane (OSP) program. A decision on full-scale development was scheduled for FY04, with crew return capability projected for 2010 and crew transfer by 2012. Dr. Doreswamy reviewed the program objectives, scope, and milestones, including technology, design development, demonstrations, and production. Among notable activities cited were the recent award of architectural contracts to three competing teams, development of an acquisition plan, and studies on schedule acceleration. A system requirements review was anticipated to begin in October.

The next topic covered was the Next Generation Launch Technology (NGLT) program, which was designed to develop technology in support of NASA's future space transportation requirements. Dr. Doreswamy touched on propulsion, vehicles systems, flight demonstrators, and systems engineering. Program activities included support of the Space Access Partnership council, budget augmentation plan submission for FY04, development of draft Level 1 requirements, and participation in the ISTP update. Among the technical accomplishments were testing of advanced injectors for kerosene rocket engines, completion of conceptual engine design, and Mach 5-7 testing of the HYTECH engine. Upcoming were flight testing of the X-43A at Mach 7 and the award of a product contract for the X-43C flight demonstrator.

The discussion shifted to program budget and structural change. Dr. Creedon noted the unexpected downward trend of allocations, which reflected the previous year's budget amendment. He also said that demonstration programs that were late for integration into the new program would have to be picked up by the OSP program.

Robert Spitzer raised the issue of technological breakthroughs. Dr. Doreswamy singled out the LOX/kerosene engine as an example of dramatic progress. Dr. Crow emphasized the need to define the context of progress. Thus, engine performance may show only incremental gains, whereas noise abatement and safety may indicate major headway.

The discussion returned to mission safety. Dr. Crow expressed concern about the apparent lack of contingency planning for rescuing the Shuttle when it functioned as a mini-space station. He and John Junkins recommended being more forthcoming with the public about the risks of Shuttle flight. Dr. Creedon suggested that this was really an issue for the NASA Advisory Council (NAC) to consider.

Mr. Cappuccio asked about the timeframe for meeting mission requirements. Dr. Creedon said that Level 1 requirement for OSP specify 2010 and 2012. If a contractor could deliver before those dates without undue risks, it would be a competitive advantage. There were discussions inside NASA on accelerating OSP program development.

Proposed Augmentation to the NGLT Program

Dr. Doreswamy continued by describing various proposed space launch missions, including Earth and Space Science robotic exploration, cargo to the International Space Station (ISS), human transport, and planetary investigations. Potential launch concepts for reusable and expendable vehicles were shown. Attention was also given to augmentation products and milestones. Dr. Doreswamy defined critical access technologies as rocket and airbreathing engines, durable structures, and responsive operations. Program augmentation goals included heavy-lift capability (90,000 lb by 2015) and medium-life capability in hypersonics (40,000 lb by 2025).

Specific comments on the NGLT program emerged during the general discussion. Mr. Cappuccio pointed out that runway smoothness played a significant role in takeoff capability and questioned whether a goal of 40,000 lb was realistic for hypersonic aircraft. Dr. Crow suggested that the horizontal-takeoff, turbine-based oxygen enrichment system now under study was completely doable, but that the cost would be quite high. In Mr. Swain's view, it would be useful to pursue four or five promising technologies at this point to keep options open. He would focus on propulsion and light-weight structures in hopes of scoring a breakthrough. Operations could always be addressed later. Ron Swanda expressed interest in hypersonic applications to general aviation.

Questions surfaced about NASA's participation in project development. Bill Hoover voiced concern about the degree to which exchange among engineers was taking place. Dr. Doreswamy replied that NASA and the Air Force each had technical as well as program staff involved in the various components of the program. He suggested, however, that planning activities were more integrated than individual tasks were.

Technology Transfer: Report of the Tiger Team

Robert Norwood started his presentation by displaying two background charts on the mission and objectives of the Innovative Technology Transfer Program (ITTP). He then focused on the Partnerships Program that targeted nonaerospace industry. The Tiger Team addressing this sector encompassed enterprise representatives, including those from Code R, and one or two representatives from the commercial technology structure. Their mission was to delineate the optimal technical transfer program for the agency—i.e., without budget constraints. They had already met three times and given briefings and would prepare a set of actionable proposal by the end of July.

Three kinds of partnership activities had been envisioned for nonaerospace technology transfer. The first was recruitment of industry partners to engage in R&D at a mid-level technology readiness level (TRL). Program representatives first needed to visit scientists within each code to determine their needs in this category before the commercial outreach began. The second type was the traditional spin-off to industry or the public.

The third was information technology support for decision-making—specifically, merger of the retrospective TechTrack database with the prospective Technology Inventory. Eventually, this integrated reference could become a powerful engineering tool.

This program would set in place a triage mechanism for the Associate Administrator. The procedure would first determine whether any component of NASA had already developed a desired technology. If not, the focus would shift to universities, DOD, industry,. or other external sources of technology. If that search proved fruitless, NASA must decide whether to develop the product inhouse or contract for it on the outside.

Dr. Norwood noted that NASA was giving some consideration to the use of return-on-investment (ROI) metrics to evaluate projects. Total agency investment would be relatively simple to calculate, but total return would be difficult. More work was needed on metrics. Tom Brackey suggested that ROI analysis might be better suited to low-risk applications. Mr. Cappuccio recommended that such investments be treated as a value proposition rather than encumbered with ROI metrics.

Dev Banerjee asked how intellectual property rights would be handled by the agency. Dr. Norwood replied that the program's database and Web site contained no enabling information. NASA did, however, have to decide which information to protect and why. Dr. Creedon noted that the agency had cut back on patent filing and maintenance because of the expense and human resources involved. Some key information might be disseminated for public benefit or to entice industry interest. Ultimately, NASA had to make an intelligent judgment about which intellectual property was commercially valuable. In Code R, only nonaerospace technology was considered for patents. Mr. Gellman questioned why the agency did not allow the marketplace to determine which technologies were valuable. Dr. Norwood said that the program's Web site allowed industry to use TechTrack to identify technologies of interest.

After Dr. Norwood's presentation, ATAC members discussed budgetary and decision-making strategies for technology transfer. Dr. Creedon pointed out that more money might flow into the program and that decisions would need to be made about the portions not earmarked. Dr. Crow recalled from his experience in industry that the transfer process should not become too bureaucratic. Mr. Cappuccio preferred to focus on spinning in research that would return far more than NASA's original investment. Mr. Gellman suggested the concept of shop rights as a win-win model for all parties. Dr. Creedon summed up the conversation: make the transfer decision by informed judgment and use metrics to calculate value after the fact.

Future NAS and the JPO

Before beginning his presentation, Bob Pearce introduced John Kern, representing the new JPO office at the meeting. Mr. Pearce then sketched out the rationale for system transformation, including efficient growth, accommodation of new business models, and safety. An emerging National Transformation Plan would align the resources and activities of NASA and other agencies, including the FAA, DOD, and DHS. Although the initial framework focused on air traffic management (ATM) transformation, attention

was now being given to costs, the environment, and operational concepts. This effort would also include an interagency R&D program and create a process for continued planning and oversight. The scope of the plan extended to UAVs. The first iteration of the National Plan for 2025, including vision statement, socioeconomic demand projections, national objectives, operational concepts, and transition roadmap, might be complete by the end of the year or shortly thereafter. Dr. Creedon noted that a research plan needed to be developed by September, or the initiative might fail.
A discussion ensued about issues that needed to be addressed by the emergent joint program. Among these were pilot error, which Ames had addressed in depth, and operational concepts employed in the RTCA and Operational Evolutionary Plan (OEP) processes. Virtual Airspace Modeling Simulation (VAMS) was considered to be key in this undertaking, although Mr. Spitzer noted that NASA still needed to refine this tool before objectives could be realized. Mr. Rediess pointed out that a significant number of agencies, universities, and companies were already working to determine the modeling required for a new NAS. There was an extended exchange about NASA's potential role in model integration within JPO.

The presentation shifted to the structure of the JPO, which comprised a policy committee and a planning office. The policy committee would consider legislative or regulatory changes that might be required to effect the needed changes in NAS. It would also approve national goals and objectives, guide and approve a national plan, support budget requests, and ensure that individual agencies did not go their own separate ways in addressing the challenges. The planning office would advocate for system transformation, advise other entities, allocate requests to agencies, and integrate agency plans.

Several issues surfaced during the general discussion. One was the extent to which NASA and the FAA should develop the systems integration implicit in the plan. (Mitre was doing a significant amount of work in this area.) Another was the involvement of the European Community (EC) and Eurocontrol. Several members questioned the extent to which the EC was willing to share information with foreign companies and officials, including the information presented at conferences or made available through direct request. Mr. Rediess, however, pointed out that recent changes in Europe allowed American companies to participate directly in the European consortium for a framework program. Dr. Brackey asked why a global plan was not being developed.

Dr. Creedon challenged ATAC to justify major investment in JPO in light of the rolling 10-year OEP review already in place and the national industry consensus on operational concepts. Mr. O'Brien pointed to the need for a multiagency plan, while Mr. Rediess emphasized the need to look beyond individual elements and integrate research and operational strategies to move aircraft in and out of airports more safely and efficiently.

Subcommittee Reports

RAS. The first area that RAS Chair Crow reported on was safety and security. He referred to the 2007 NASA goal to increase air safety by a factor of 10, which applied only to commercial aviation. If current NASA technologies were implemented, a fivefold improvement could be expected. On the other hand, CAST and industry were attempting

to implement changes projected to achieve a sevenfold improvement, even though little that NASA had developed would be used. Mr. O'Brien suggested that if industry would deploy certain elements of the NASA safety research program, the 10-fold-change target would be within reach. CAST, however, insisted upon cost-benefit analysis, and on that basis rejected technologies such as synthetic vision in recent years. If NASA had failed, he said, it was in its inability to produce both effective and affordable new safety technology. Mr. Hertz pointed out that synthetic vision did appear in the CAST plan for *future* implementation. He also acknowledged NASA's lack of a systems analysis capability at one time in safety, and described the ASSIST process used in its place. Dr. Crow and Mr. Spitzer agreed that NASA's systems approach had improved recently.

Mr. O'Brien suggested that it was time for ATAC to take advantage of the expertise of those working in the safety field by making them a formal part of NASA's advisory structure. The RAS Safety Working Group could serve that function if its sunset provisions were set aside and if its willingness to become a standing committee was approved. Mr. LaFrey expressed some concern that Code R might become constrained by too much outside input and that NASA needed to maintain its own independent view of the issues. Dr. Crow agreed in part; he then underscored the added credibility that an ongoing body of expert advisers could bring to the safety arena.

In the area of ATM and NAS, Dr. Crow noted that John Hansman was RAS' lead, as well as a member of REDAC. He said that there was work in the process of being implemented by FAA and that modeling efforts needed to be in sync with what JPO was doing. NASA was struggling with validation in this regard. Otherwise, the programs in this area seemed to be on track. Dr. Crow noted that RAS had agreed to represent ATAC at REDAC.

In Vehicle Systems, Mark Anderson chaired the working group that was developing technology metrics for commercial engines and airframes. Vehicle types included subsonic transport, supersonic aircraft, runway-independent aircraft (RIA), personal air vehicles, and UAVs. Common technologies had already been found among these. Dr. Crow praised the energy and productivity of this group, which had met many times. He was pleased that a realistic set of goals had emerged from this process that NASA and others could pursue. Discussion about melding programs with other agencies was needed.

Mr. Swanda voiced his impression that NASA staff did seem to have an obvious knowledge of safety in general aviation. Dr. Crow indicated that he had asked the Safety Working Group to take on this topic.

(Recommendations of RAS can be found in the Action Items at the end of this report.)

ASTS. Filling in for ASTS chair Mercer, Dr. Doreswamy reviewed the recent ASTS meeting in May, which covered the X-37, OSP development plans, general features of NAI, and probabilistic risk assessment. He next offered the committee's observations on the Shuttle loss, including the current stand-down, and outlined various factors that could

delay redeployment. Specific recommendations were outlined for both OSP and NGLT, as well as for greater representation within ATAC (see Action Items).

In the general discussion, Mr. Cappuccio asked whether Code R had developed contingency plans for accelerating NGLT if a breakthrough occurred. Dr. Doreswamy indicated that nothing definite had been prepared.

PRTS. Dr. Katehi noted that her subcommittee had addressed three programs at the May meeting: Enabling Concepts and Technology (ECT); Computing, Information, and Communications Technology (CICT); and Engineering for Complex Systems (ECS). Overall PRTS was impressed with the high quality of work being performed. Members were also satisfied with proposed restructuring of the NASA Research Announcement (NRA) program; the effort to consolidate certain space communications programs; and attempts to achieve program traceability. There was nevertheless sentiment that the R&D portfolio was underfunded in certain areas (e.g., space communications) and that an investment plan was needed. It would be useful to link technologies to enterprise objectives and include infrastructure as a direct part of the R&D portfolio.

Dr. Crow and Mr. Swain questioned whether everything that NASA might be doing or considering in high-end computing might not already be available elsewhere. Dr. Crow gave collaboration systems as an example. It was pointed out, however, that even though NASA could buy such systems off the shelf, the agency still had to customize them for its own purposes. Dr. Katehi noted that some of NASA's enterprises were using incompatible software that contractors had imposed upon them.

The discussion also touched on the need for program transition. Dr. Katehi described the Hyperwall Project, a powerful research and design tool for producing simultaneous solutions to problems. She suggested that NASA was not offering sufficient guidance to staff for making such exciting technology available to industry or transferring it elsewhere in the agency. Roadmaps should be general enough to encompass such innovation. Dr. Katehi questioned, however, free-wheeling innovation that might yield noteworthy results but did not obviously connect with NASA's strategic objectives.

The discussion of transition raised the subject of project longevity. PRTS had considered non-NRA programs that could run between 2 and 6 years. Mr. Spitzer observed that a 6-year time span entailed a huge cultural issue for staff associated with a long-running project. Dr. Junkins noted that staff who worked on several projects could cope with a downsizing more easily than those committed at 100 percent to a single contract.

University Strategy

Michael Reischman first provided ATAC with background information on the underlying and operating principles of NASA's relationship to university education. He emphasized NASA's recognition of academia's enormous contribution to science and technology. He also noted the constraints on university funding from both the agency and industry. By law, NASA was obligated to transfer knowledge gained through funded academic

research to the institutions engaged, although the agency maintained access to that information.

The presentation shifted to university funding levels for AT, SLI, MSM, and ITTP. Support totaled $158 million, including $34 million in earmarks. MSM maintained the highest percentage—20—while Code R as a whole averaged 9.8. On a full-cost, competitive (i.e., nonearmarked) basis, overall university funding represented only about 5 to 6 percent of the enterprise program budget. In FY02 , individuals and small research teams received $123 million. Principal investigators normally received $100,000 to $200,000 for their projects. Recently NASA set aside $40 million to balance its portfolio by funding larger scale partnerships such as the University Research, Engineering, and Technology Institutes; the University Affiliate Research Center at Ames; and the National Institute for Aerospace at Langley.

A discussion followed on the sizable impact of NASA's university funding on campuses, industry, and society. Dr. Gellman noted that a third of such monies helped support the central administrations of universities—an amount that he considered excessive. Dr. Junkins, however, observed that university officials could contribute as well by sharing costs with resident aerospace projects. Several ATAC members also emphasized the significance of NASA-supported campus programs for workforce revitalization in the aerospace field. Dr. Katehi suggested that the agency's intermittent funding of university projects in the 1980s left behind an atmosphere of distrust that still must be overcome. For such reasons, Mr. Spitzer recommended that NASA take the high road with consistent support for university R&D.

Mr. Reischman continued by outlining the implications of the Code R reorganization for University Programs. A new vision and strategy have emerged that emphasize diversity, long-term relationships, straightforward communication, cutting-edge research, workforce development, and aerospace advocacy. The competitive strategy proposed for NRAs should allow principal investigators to partner with others creatively.

Thursday, June 26

Enterprise Report, Part 2

Dr. Creedon began by explaining the bookkeeping differences within NASA before and after full-cost accounting takes effect in October. Before the change, the cost of people, C of F, and cost to keep Headquarters and the centers operating were invisible in the budget. These expenses would soon become visible and change the decision-making process. When the new rule goes into effect, the overall impact should be revenue neutral—i.e., bottom lines should remain the same even though line items change.

The presentation shifted to support for projects in transition at the centers. Code R was about to emulate what industry did in human resources deployment. The enterprise would start investment accounts at all four of its field centers. When programs were terminated, affected employees would be assigned to one of those accounts if it is not already depleted for a discretionary program. To prevent other programs from being drained,

center directors would feel pressure not to retain affected employees too long. Money for the program would be gathered through center G&A assessments of programs.

Turning to facility costs, Dr. Creedon noted that the general policy would be to charge full cost to proposed customers, even though this could become quite expensive for long-term continuous use (e.g., a year or more). As a result, some companies might elect not to contract for them. If Code R determined that it had a long-term strategic stake in maintaining a facility, it could subsidize the facility out of a reserve fund during the slack periods. Dr. Creedon emphasized that these reserves were small and would be applied to only a tiny core of sites. Full-cost accounting would thus force many difficult decisions about shutting down facilities. He noted that 50 percent of NASA's wind tunnels had been closed in the last 10 years.

Mr. Messina asked whether there was a risk of using this investment pool to maintain an unwanted but favored facility. Dr. Creedon acknowledged the risk but expressed his preference for trusting center directors to exercise good judgment. It would be difficult, he added, for center administrators to hide a sustained subsidy. If a problem persisted, the center directors could always be replaced.

Dr. Creedon also addressed Dr. Brackey's concern about support for needed new facilities. The easiest solution might be to locate C of F monies for the purpose. Otherwise Code R could create a small program, call it the facility, and fund it. In the long term Dr. Creedon foresaw the occasional opening of new sites, as well as the occasional closing of old ones.

At Dr. Banerjee's prompting, the discussion shifted briefly to trends in Europe. Dr. Creedon said that comparisons of facility use there were hard to draw because of the complexities of the subsidy issue. Mr. Gellman noted that the European 20/20 plan took the long view by keeping facilities open for potential future users.

Mr. Maclin commented that industry had a good deal of experience to share with NASA regarding technical expertise lost to downsizing. Dr. Creedon agreed that the agency needed to talk to industry about handling the problem. He said that unlike the private sector, NASA was usually obligated to allow 18 months for the process, so that the staff/competency dropoff would not be precipitous. Before September 11, the trend had been toward downsizing, but since then the issue was being reevaluated.

Dr. Crow suggested that NASA consider competency certification for its workforce. Dr. Creedon noted that NASA had already proposed 137 categories across the agency. He agreed with Dr. Crow that a much smaller number would be much more practical.

Returning to the issue of facilities, Dr. Creedon reviewed the major findings of the RAND report. These included the continuing critical importance of NASA's wind tunnel and propulsion test facilities, the danger of imposing full facility costs on prospective users, the general lack of redundancy across the agency, and the need to establish and support a core of key facilities to serve long-term needs.

Dr. Creedon reported briefly on a new effort to visit individual companies rather than relate only in a collective industry context. Selected sites were active in ATM, engine, or aircraft development. NASA staff wrote letters to the companies to outline what they had learned from the visits. Industry feedback on the content of the letters was encouraged.

The next topic addressed was rotorcraft. Dr. Creedon explained how NASA had been moving out of this field for some time and had finally decided to terminate involvement in it. Because of continuing support in some quarters of the agency, however, there was now a $15 million NASA program approved by OMB to work with rotorcraft companies. OMB advised NASA not to fund any DOD-related activity. In no case can DOD fund less than half of such ventures. Dr. Creedon asked ATAC's advice about the wisdom of focusing on one rotorcraft. His own inclination was to determine what the Army wanted and to help the military achieve it. He suggested that it would be better for NASA to use its own funding for this and to justify it by pointing to the civilian applications. Dr. Banerjee observed that all rotorcraft development in recent years had employed technologies common to both military and civilian uses. Mr. Swanda suggested that small airports might benefit from personal vertical flight vehicles in the future.

The discussion returned to the proposed change in NRA eligibility: Should NASA be allowed to bid in these competitions? Dr. Creedon mentioned the most commonly expressed concerns, such as the possibility of self dealing and the lack of firewalls relative to individual companies. His biggest reservation was that the change would stifle conversation between customers/partners and the agency. Mr. Hertz and Mr. Hoover voiced similar fears. Dr. Katehi, however, pointed out that the very reason that competitors approached NASA centers now for ideas and feedback was the expertise residing in those centers. Without a chance to bid on NRAs, some of that expertise could be lost. She strongly supported the change. Despite his reservations, Dr. Creedon also acknowledged that he was now in favor of it.

Proceeding with his presentation, Dr. Creedon reviewed the actions taken by Code R in response to concerns expressed by ATAC. Most of the responses had been coded green. These included flow of objectives to themes, Headquarters reorganization, improved availability of information on facilities (feedback on Web site requested), and the RAND Study. Other areas fell somewhat short, including NASA development of Level 1 requirements for NAS, a defined role for UAVs, and enlargement of aircraft security to aviation security. Code R still needed to clarify needs on tools, systems engineering, and best practices. In the area of patents, it had become too expensive to fund anything other than nonaerospace applications of commercial value. Patenting aerospace technology, moreover, seemed to work at cross-purposes with the catalytic mission of the agency.

ATAC members refocused on the merits of sharing information with other countries. Several members expressed frustration with the lack of access that they had encountered while seeking technical data in Europe or conferences. Dr. Katehi, however, commented that because the opportunities for interactions with technical industry staff were limited, she found it easier to access information through colleagues in ESA.

Enterprise Strategic Plan

Mr. Pearce began with a chart showing the relationship among strategic documents and the flowdown of the agency's plan into the enterprise's. He described how various elements such as theme organization around goals, as well as credible strategies and objectives, advanced the purposes of the agency. Various cross-cutting approaches were singled out: strategic program alignment, customer focus, systems analysis, strategic partnerships, and flexibility. Together these could help create an infrastructure for exploration beyond low-earth orbit. For each theme objective Mr. Pearce sketched out methods, metrics, center roles, and key partnerships. A draft fleshing out Mr. Pearce's outline should be available for ATAC review in approximately 2 weeks.

A discussion followed that took up the issue of numeric goals again. There appeared to be consensus that quantified targets at the strategic agency level could pose high risks and that such targets, if employed, fit better at the program level. Mr. Pearce noted, however, that the European 20/20 vision document did contain numeric information.

ATAC Membership Poll

In the final meeting segment, Mr. Swain asked committee members to offer their comments and recommendations. Their remarks are summarized below, and their recommendations are incorporated into the action items that conclude this report.

Mr. Swain. This was a great meeting with good progress toward aligning program with strategy and following up action items. OSP is not a long-term issue; the need for transition is urgent. The scope statement on JPO does not seem to commit to developing Level 1 requirements. The JPO concept is acceptable as a planning function but not as an implementation mechanism; it needs to have a program office with accountability. The university program is a step in the right direction. A stable income stream (up to 20 percent in some areas) would help. I support full-cost accounting and personnel policies to retain competent staff after program termination. On NRAs, I am not persuaded by all the arguments; NASA should not use these competitions to maintain base capability. The agency may find that NRAs do not work in some areas. It would be useful for the agency to do systems analysis at Headquarters to determine the value of technologies being developed at the centers. Finally, stretch goals may have implications for rule making.

Mr. Cappuccio. For JPO, it is not clear how NASA wants to participate. The agency should exercise a leadership role. JPO should have a specified lifetime to force policy development. On NRAs, partnerships involving the agency would be good because staff competitiveness and technical merit would be tested. I have mixed feelings on rotorcraft because the market direction is unclear. NASA could benefit from more information on DARPA's ongoing work in this area.

Dr. Banerjee. Air transportation system transformation is a high priority spanning the entire spectrum of evolutionary-revolutionary technologies; systems assessment of it may not be an ideal function to be contracted out. The workshops are excellent; modeling workshops can help develop roadmaps for industry. Rotorcraft development requires input from DARPA and DOD.

Dr. Brackey. It is good for the agency to be thinking about the big systems approach, risk assessment, and management of public expectations. I am uncomfortable with the NRA change but accept it; it should be monitored for a couple of years. In university interactions, centers need explicit guidance. With individual researchers, it is unwise to keep moving money back and forth.

Mr. Messina. JPO must be explicit about technology transfer to FAA. This will help meet metrics and performance goals in air space management. In software engineering and processes, NASA needs to understand the real issues at the enterprise level; industry can help with this. Opportunity management is as valuable as risk management.

Mr. Spitzer. It is important for NASA to exercise leadership in its role within JPO. The university activities seem more coherent than in the past. Presentations at the ATAC meetings could be more focused (see action items). NASA should always investigate activities in other agencies to prevent duplication of effort.

Mr. Swanda. The Vehicle Systems program can help the work of the Aerospace Commission. I hope the program can be put into the budget next year and made a reality. Software issues: FAA involvement is necessary for certification. Combining safety and security in one program is a mistake; funding will go back and forth between the two areas, starving one or the other. Full-cost accounting has implications for NRAs; this area needs clarification (see action items).

Dr. Junkins. NGLT is NASA's biggest challenge and opportunity; it should be the No. 1 priority for the next few months. It is time to decide when this stops being a research issue and becomes a program; it should stay in Code R. NASA's role in JPO is not clear, especially implementation and feedback loops. I am pleased with university programs and the NRA changes, which allow NASA centers freedom to look for teaming partners in academia and industry. Safety and security pose a management challenge for coordination of agencies.

Dr. Katehi. PRTS is concerned about the forthcoming NRC report with a key metric centered on publications. Roadmapping should not become too bureaucratic. University relationships are underexploited, with many opportunities available for NASA staff: visiting professorships and sabbatical appointments, workforce training, short courses, and long-distance education. NASA needs to maintain long-term relationships with universities to regain campus credibility.

Mr. Maclin. Staff recruitment is a real problem in industry; NASA should continue to work on this. In Vehicle Systems, I agree with the current process, although results remain uncertain.

Dr. Crow. At the agency level, program budget control and full-costing accounting will have a profound impact that will ultimately prove positive. No best-practices approach is visible in the management of programs or conduct of research. In goal-setting, beware lest false expectations be raised. At the program level, the ATM system is very important. JPO is a great idea, with NASA's role in systems engineering pivotal. The university program is outstanding though not always presented with the best arguments (see action items). In NGLT, systems characteristics should define the technology needed for safety, cost, and required energy.

Mr. Gellman. At FAA there is a perception that security is diminishing NASA's safety effort. Much proposed safety work is unique, whereas security proposals may not be. In JPO, some agencies may drop out and leave a vacuum for NASA to fill. The JPO discussion did not address the unique bridge needed between NASA and FAA regarding ATC and safety; both NASA and FAA are ducking the issue. Technology transfer from NASA to FAA should not be neglected. The agency should explicitly acknowledge that it courts greater risk than industry can afford to. In the transfer area, spin-in is a powerful tool. Spin-out creates great value for NASA. In facilities, I question business models for wind tunnel decisions; the enterprise should embrace longer time horizons. NASA should consider market conditions before making key decisions.

Mr. O'Brien. JPO is not quite defined yet—maybe a good thing. I support the JPO idea. NASA should consider which resources it can commit. It cannot afford to wait for JPO to jell before acting in the near-term window on capacity. Safety issues mirror those addressed by RAS' working group. Human factors work at Ames could illuminate the human-robotics issue.

Mr. LaFrey. JPO needs to address issues like aircraft separation—look at the Ames work. NASA should have its own systems engineering view apart from those of others. FAA needs products, not technology. NASA is best suited among Federal agencies to address wake vortex.

ATAC Action Items

Recommendations for NAC consideration:

Joint Planning Office (JPO)

The Interagency Joint Planning Office, which has NASA and the FAA as key members, is vitally important in the transformation of the air transportation management system for the coming decades. However, the ATAC has concerns regarding the NASA role within the JPO and the role of NASA in providing technologies and system engineering expertise for any future air traffic management system. Specifically:

- The JPO needs to define clear level 1 requirements for the next ATM system.
- JPO and NASA must determine the agency's (NASA) specific roles in research, technology transfer (from NASA to FAA), and modeling/simulation
- NASA must determine what specific leadership role it wants in the JPO and any follow-on programmatic efforts. However, the ATAC recommends NASA must have a strong, pro-active, leadership role in the JPO and staff it accordingly.
- The JPO and NASA should decide when and how to bring global aviation partners from Europe and Asia into the fold as planning moves forward.

Space Launch Initiative

The ATAC finds that ISS requires safe transportation of crew to and from the Station. The loss of Columbia has resulted in a stand down of the Shuttle and reliance on Russian Soyuz as the single temporary method of crew transportation. The ATAC specifically recommends:

- It is imperative to provide an alternative system of crew transportation to and from the ISS as soon as possible.
- Strongly recommend that NASA restructure the OSP program to provide operational capability as soon as possible.
- The OSP program should be viewed as one of national urgency and the acquisition methods be streamlined as done with past programs labeled a national urgency.
- Level – one requirements should be revised to reflect an accelerated IOC.

The ATAC also strong endorses the NGLT program and the essential building block technologies it is developing. We strongly urge an augmented funding plan that is stable and predictable for the future success of the program.

Agency and Enterprise Strategic Plans

ATAC consensus that quantified targets at the strategic agency level could pose high risks and that such targets, if employed, fit better at the program level.

Recommendations and Actions for Code R from June 25-26, 2003 ATAC meeting

Enterprise and Advisory Committee

- ATAC should consider giving ASTS more visibility by adding another member to the ATAC from ASTS or its constituency.
- ATAC should invite a representative from DHS to join the membership.

Mission and Science Measurement Technology

- MSM should develop an R&D portfolio and strategic investment plans.
- MSM should establish exit and renewal strategies for their efforts during their program planning. A systematic process for internal evaluation needs to be developed.
- MSM should develop transition plans for successful efforts and technologies.
- NASA should develop metrics for success and assessment.
    - NASA should take into account a variety of metrics for evaluating programs rather than emphasizing publications the way that the NRC report does. NASA should maintain different criteria for different TRLs.

JPO and the NAS Transformation

- NASA and REDAC should plan a joint meeting around the time of the JPO outbriefing to allow for consideration/endorsement of what is being proposed.
- Note ATAC recommendation to NAC for consideration above.

NGLT

- See above ATAC recommendation to NAC for consideration

OSP

- See above ATAC recommendation to NAC for consideration

Safety and Security

- General sense of the ATAC that Code R needs better coordination and knowledge of the technological needs of TSA and DHS. ATAC recommends NASA/Code R to develop an MOU/MOA with DHS on security and safety technology development to ensure NASA work makes it into the system.
- Desire that NASA should treat explosive detection systems as a critical technology priority.
- Desire to have at least a senior person from either TSA or DHS on the ATAC and RAS.

Strategic Plan

- Code R should reframe and simplify its approach—e.g., here is where the enterprise is, here is where it is going, here is how it reaches its target, here are the resources.
- Program staff should send ATAC a draft plan when completed (about 2 weeks).

University Strategy

- NASA should establish strategic targets in university policy, such as 20 percent of funding for MSM and perhaps 10 percent for aerospace technology.
- NASA Headquarters needs to issue strategic guidelines to the centers regarding the amount of funding that should go to universities. The income stream should be stable.
- NASA should determine the appropriate balance between large- and smaller-scale university research programs.
- NASA needs more innovative programs such as post docs internships, sabbaticals for professors, to infuse additional ideas and approaches to its research.

Items for Next ATAC meeting.

ATAC should spend significant time (more than an hour) at its next meeting to discuss vehicle systems analysis.

For the next ATAC meeting, we should arrange for an educational briefing about the current state of aviation safety, including current levels, plans for improvement, and goals for both commercial and general aviation; the presentation should include relevant data, a the current baseline.

Aviation Security, what is the current situation? What is in the technology pipeline to help improve security?